See following p. 330

551.578.7(439.1)

HAILSTONES OBSERVED AT BUDAPEST JULY 13, 1922

By A. RÉTHLY

On July 13, 1922, toward evening, dark clouds approached quickly from the NW. Arriving above the town, thick hail and rain showers poured down, accompanied by weak thunder. The hailstones soon covered the flower stand before the window, and plenty of them could be gathered. The quantity of precipitation during the thunderstorm amounted to 5.6 mm. (0.2 inch) and according to the records of the ombrograph the rain lasted 10 minutes.

The hailstones were of diverse shape; some of them had a substantially spherical structure, others had, besides the spherical shelled feature, also a radial structure. All were soft and light, and when falling to the ground they got flattened; many of the hailstones had a pronged border and some of them had protrusions of the length of 6 to 8 mm. I made sketches from some of the selected hailstones and Mr. Tihamér Kuharszky had the kindness to draw (according to my instructions) the accompanying figures which show the hailstones in natural size. Some of them remind us of those which we observed in Ó Gyalla on April 26, 1903 (Hann: Lehrbuch der Meteorologie III edition, p. 709).

From the five hailstones selected seven drawings appear on the accompanying plate (fig. 1), to which I beg to make the following observations:

1. A larger hailstone, which has a larger air bubble at its center and many minor air bubbles around it. This hailstone was composed of two very sharply limited parts: An exterior part, clean white, and the inner part built up of spherical shells which surrounds the kernel containing the air bubble.

2. A hailstone of very pronged border, some of the protruding parts were of 4–5 mm. length. The inner white kernel, opaque and milk colored, was surrounded by an exterior water-clear ice layer.

3. A larger inner kernel, white and opaque, filled with small air bubbles; the exterior transparent shell has a very fine radial structure.

4. Formless hailstone filled with small air bubbles and bearing several larger protruding parts. In the central part an opaque, milk-colored kernel.

5. This is the most fantastically shaped hailstone of all. Figure *a* shows the side view; we see here protruding horns, which acquire the length of 7 mm. on the right side, a length of 4 mm. and a breadth of 3–4 mm. on the left side. The interior part is of a spherical shelled structure, the innermost shell surrounding the kernel is distinctly radial and white, the outer part is transparent and feebly radial. The kernel is clear white. Figure *b* is the same hailstone as seen from above. Figure *c* is the cross section of the hailstone. The kernel is surrounded by a transparent ice shell, embraced by a milk-colored shell, which is surrounded by opaque ice. This hailstone was thus composed of four layers which could be sharply distinguished.

TORNADOES FROM ARKANSAS TO VIRGINIA, APRIL 29–30, 1924

551.515(73)

By HERBERT C. HUNTER

[Weather Bureau, Washington, D. C., June 2, 1924]

The most notable group of tornadoes in the United States for some years occurred within a period of about 26 hours, late in April, in the Southern and Southeastern States. The low-pressure area concerned was the one which is designated XI *A* in the chart of tracks of cyclones in this issue. The center of the LOW was near Wichita, Kans., on the morning of Tuesday, the 29th, with minimum reading 29.44 inches; north of Little Rock, Ark., 12 hours later, with reading 29.46 inches; near Louisville, Ky., on the morning of the 30th, reading 29.38 inches; and southeast of Pittsburgh, Pa., the evening of the 30th, with reading 29.34 inches. (All pressure readings are reduced to sea level.)

The hours of occurrence were from 2:30 p. m., 90th meridian time, of the 29th, to 5:30 p. m., 75th meridian time, of the 30th. It is thought there were 21 distinct tornadoes, in numbers by the States in which they originated, thus: Arkansas, 1; Louisiana, 2; Alabama, 5; Georgia, 8; South Carolina, 1; North Carolina, 2; Virginia, 2. One storm starting in Alabama continued into west-central Georgia, and another of great importance from northeastern Georgia followed a long path across northern South Carolina.

There is considerable possibility of two other tornadoes, in Georgia and South Carolina, respectively. As usual in the southeastern quadrants of well-developed LOWS, there were many thunderstorm gusts and hailstorms not far distant from the tornadoes.

The three tornadoes of the afternoon of the 29th were nearly in a north-south line; but the first one, in southwestern Arkansas, was slightly farther to the west than the others. The times of the northern and the southern were 2:30 p. m. and 6:30 p. m., respectively; the places of the three, a little north of Texarkana, Ark., Crichton, La., and Many, La.; the intervals, in miles, from north to middle, about 100, and from middle to south, 40. The Texarkana tornado advanced northeastward, but the Many one to eastward; the tracks were narrow, except for the Many storm, the path of which varied from a quarter mile to a half mile in width, and was a few miles long. The Texarkana and Many storms caused one death each, and in all three cases there were people injured and buildings wrecked, the property loss being greatest at Many.

The office at Shreveport is between Texarkana and Crichton, considerably nearer the latter. The strongest wind of both day and month occurred there shortly before noon, the lowest barometer of both day and month at 3:40 p. m., and there was a brief thunderstorm, not especially notable, with hardest rain very close to 4 p. m.

After an interval of about eight hours tornado activity was resumed almost 400 miles to eastward of Many. Autaugaville, Autauga County, is in central Alabama, and here the storm occurred at 2:45 a. m. of the 30th; the damage amounted to $30,000 and two persons were slightly hurt. It may have been this same tornado which struck a locality 90 miles distant, in direction from Autaugaville between northeast and east-northeast, at 4:30 a. m., but it seems better to count this later occurrence as a distinct storm. The locality is near the northern edge of Chambers County, between Welsh and Roanoke, not far from the Georgia border, but the tornado apparently did not even reach the State line. This locality suffered one death, several injuries, and damage of fully $25,000.

Soon after the tornado passed near Welsh, two new tornadoes formed well to the southward of a line joining Autaugaville and Welsh. The more western was at Greenville, Butler County, at 4:50, and what was probably the same storm was 50 miles to northeastward, in northwestern Bullock County, an hour later, and in southeastern Macon County at 6:30. Great property loss and 8 deaths resulted from this tornado, which was about 40 miles distant from Autaugaville at a time 150

minutes later than the earlier tornado at that place. The more eastern of the new tornadoes was 25 miles distant when nearest Welsh and about 50 minutes later (5:20 a. m.); this tornado had formed about 5, in southern Lee County, and is probably the storm which struck Chipley, Ga., and Warm Springs, Ga. The times reported are 6:15 at Warm Springs and 8:30 at Chipley; but the latter is thought to be in error, otherwise there would seem to have been a later tornado, probably of short path, practically on the path of a long, earlier storm. The Lee County to Warm Springs storm moved nearly 50 miles northeastward; 15 deaths resulted, 11 of them in Georgia.

The final Alabama tornado was reported in Pike and Barbour Counties at times from 6 to 7:15, and seems to have moved but very slightly north of due east; 1 death resulted. This storm was about an hour later than and 35 miles southeast of the Bullock County tornado.

In Georgia at this time there seem to have been more distinct tornadoes than in any other one State—9 in all, but only 7 wholly within the State. The movement was usually to east-northeastward, but in some cases nearly due east. The hours of occurrence, when charted, give puzzling results, departing considerably from the orderly geographic sequence which is found in most other States.

The tornado from Alabama which reached Warm Springs came into Georgia at 5:30, 90th meridian time. So the first tornado activity in Georgia was at Lawrenceville, Gwinnett County, at 6, 75th meridian time.

This place is several miles northeast of Atlanta, and is considerably farther north than the path of any tornado previously mentioned. This tornado seems to have advanced 185 miles in all, but reached the ground only at intervals; the property losses are found as $2,200,000, or somewhat more than the damage of all the other tornadoes of the two days combined. It reached Royston, Ga., 55 miles from Lawrenceville, at 7 and 20 miles beyond crossed into South Carolina. Anderson was reached just after 9, and here there was great property loss, while 8 persons were killed. The southern part of the city was traversed and two large mills were considerably damaged. East of Anderson the tornado did damage in or near Eden, Gray Court, Moore, and Walnut Grove, and was last reported as being near Hickory Grove about 11 a. m. As Walnut Grove and Hickory Grove are several miles north of a line drawn close to Anderson and Gray Court, it is possible that there were two distinct tornadoes in this part of South Carolina during the latter part of the forenoon. Only 1 death—in Georgia—is attributed to this storm, or these two storms, outside of Anderson.

The 7 tornadoes wholly in Georgia are reported as occurring at the places and hours named, the times being 75th meridian save in the two cases where "(90th)" follows: Albany, 7:10 (90th); Brookton to Cornelia, 9 to 9:35; Reynolds, 8:30 (90th); Ficklin, 9:30; Macon, southern suburbs, 9:30; Fitzgerald, 10; and Sylvania, 12:45—this last alone being after noon. The deaths resulting were 1 at Ficklin and 3 at Macon. Damage to property was $200,000 at Macon; $50,000 each at Cornelia and Fitzgerald; but elsewhere less, and especially little at Albany and Sylvania. There is a slight chance that the Albany and Fitzgerald tornadoes were merely separate appearances of a single storm; otherwise, consideration of the locations and hours leads to the belief that the storms were independent.

The official in charge at Macon, Harry Raynes, has furnished a report of the storm near that city, from which these statements are extracted:

> At 9:02 thunder was first heard, the storm being in the south-southwest. Small hail fell from 9:17 to 9:22, and about this time the rain increased from gentle to heavy. The wind shifted to northwest and west-northwest at 9:26. During the hard rain and for a half hour after it ceased, small twigs, leaves, pine cones, and pine needles were falling from a great height. (The nearest pine trees are a mile and a half distant.)
>
> Shortly before 10 a. m. a dark, squirming, funnel-shaped cloud in the east-southeast was visible from the office window for about a minute.
>
> A close eyewitness described the clouds as a spiral, funnel-shaped, whirling mass, demolishing everything in its path of not more than 300 yards in width. About the top of this mass of clouds there was observed a continuous display of electrical phenomena, accompanied by loud detonations of reverberating thunder.
>
> Signal posts of the Central of Georgia Railway, built of steel, embedded in concrete, which is buried 4 feet in the ground, were lifted out of the ground and twisted. The posts are said to weigh more than a ton each.

Between the times of the Fitzgerald and the Sylvania tornadoes in Georgia, and about the time that the northern tornado in South Carolina was ending, the severe southern tornado was starting. This followed a path about 60 miles to southward of the northern one, and was about 100 minutes later at points abreast.

Starting about 11 miles northeast of Aiken, Aiken County, at 11 a. m., the tornado was last observed 135 miles away, in direction east by north, near Pamplico, Florence County, at 2:45 p. m. It passed through or near Edmund, Lykesland, Horrell, Horatio, Dalzell, Dubose, Wisacky, and Lamar, but no large community was encountered, so, in spite of the width of path, sometimes as great as 1,400 yards, the damage was only about $1,000,000. But the loss of life was 67, greater than from any previous tornado in South Carolina, as far as records have revealed.

While this disastrous storm was moving across South Carolina, there were 2 short tornadoes in North Carolina. The earlier, at 12:30 p. m., was north of Pittsboro, in Chatham County; it traveled 2 miles northeastward and caused 4 deaths and property loss of $20,000. The later started slightly more than 100 miles to eastward of Pittsboro, being southwest of Robersonville, Martin County, about 2:30 p. m.; its movement was 15 miles to northeastward, and it resulted in damage of $200,000 and 1 death.

The last two tornadoes occurred in southeastern Virginia. About 5:30 p. m. there was a path of moderate length, about 10 miles, in Amelia County, from southwest to northeast. The greatest damage was at Maplewood, near where the storm started, where several were injured, one man fatally. The total damage done by this storm was $30,000. The place of occurrence was 130 miles to northeastward of the western North Carolina tornado, and nearly as great a distance northwestward of the eastern North Carolina storm. The other Virginia tornado occurred about the same time, 50 miles southeastward of Amelia County, near Pleasantshade, Greensville County; it was short and of narrow path, but by destroying a building it caused about $1,000 damage.

The loss of life in these 21 storms was 114, and the total damage, conservatively estimated, with reports lacking as to a very few points where probably it was small, foots up a little more than $4,000,000.